DESCRIPTIVE CATALOGUE

OF THE EXHIBIT OF

THE WELLCOME
CHEMICAL RESEARCH LABORATORIES

AT THE

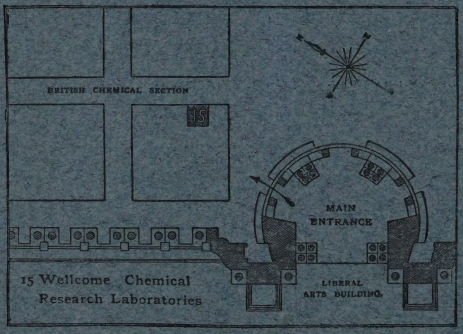
INTERNATIONAL EXPOSITION, ST. LOUIS

1904

EXHIBIT No. 15. BRITISH CHEMICAL
SECTION. LIBERAL ARTS BUILDING

THE WELLCOME CHEMICAL RESEARCH LABORATORIES
FREDERICK B. POWER, PH. D., *Director*
6, King Street, Snow Hill
LONDON, ENG.

INTERNATIONAL EXPOSITION, ST. LOUIS, 1904



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DESCRIPTION OF THE EXHIBIT

THIS exhibit is designed to be illustrative of the work accomplished in the Wellcome Chemical Research Laboratories, and in connection therewith it has been deemed of interest to present a concise description of it, in order to indicate the purpose and extent of the scientific researches upon which it is based.

The work undertaken in these laboratories—founded by Mr. Henry S. Wellcome in the year 1896, and since then under the direction of Dr. Frederick B. Power—has been of a most varied character and wide range, representing almost every department of chemical and pharmaceutical science. The investigations have comprised, for example, the devising of new methods of analysis; the examination of drugs of reputed medicinal value from distant lands, Africa, India, and the Fiji Islands, as well as those indigenous to Europe and North America, in order to determine both the nature of their active chemical constituents and their pharmacognostical characters; the study of the constituents of various essential oils; the constitution of some of the more important alkaloids and other chemical substances of special therapeutic value; and the preparation of new chemical compounds by synthetic methods, both chemical and electrolytic.

The detailed results of these investigations have been published, for the most part, in various scientific periodicals and transactions, such as the *Journal of the Chemical Society*, London, the *Journal of the Society of Chemical Industry*, the *Year Book of Pharmacy*, the *British Medical Journal*, and the *Proceedings of the American Pharmaceutical Association.* These published papers, at present more than 40 in number, have been distributed from time to time to such institutions and persons as have been thought would be specially interested in the subjects of which they treat, and desirous of preserving a record of them.

In the following remarks an attempt has been made to briefly outline the results of the work thus far accomplished.

A New Type of Gold Salts

Some observations made during the course of an analysis led to the discovery of a new type of gold salts of the alkaloids, of which those of atropine, hyoscyamine, and hyoscine were prepared and characterised. (*Journ. Chem. Soc.*, 1897, **71**, pp. 679-682.)

The Official Hypophosphites

The chemical characters of these have been more definitely established, and a reliable method devised for the determination of their purity. (*Year Book of Pharmacy*, 1898, pp. 409-423.)

Acid Phenylic Salts of Dibasic Acids

A general method for the preparation of acid phenylic salts of dibasic acids has been developed, and a number of such new compounds having valuable medicinal properties were prepared, among which may be mentioned guaiacol camphorate and creosote camphorate. (*Journ. Chem. Soc.*, 1899, **75**, pp. 661-669.)

Assay of Commercial Phenols

In direct connection with the preceding investigation, a new method was devised for the assay of commercial phenols. (*Journ. Soc. Chem. Ind.*, 1899, **18**, pp. 553-556.)

The Alkaloids of Jaborandi Leaves

An extended and exhaustive research was undertaken for the purpose of elucidating the nature of the alkaloids of jaborandi leaves, with special reference to the chemical constitution of the alkaloids pilocarpine and *iso*pilocarpine. This investigation, which occupied four years, and required the use of large quantities of very valuable material, was finally brought to a successful issue by establishing for the first time the true constitution of these alkaloids (*Journ. Chem. Soc.*, 1900, **77**, pp. 473-498, 851-860; 1901, **79**, pp. 580-602, 1331-1346; 1903, **83**, pp. 438-464; also *Year Book of Pharmacy*, 1899, pp. 435-441; and *British Medical Journal*, 1900, pp. 1074-1077.)

Glyoxaline and Pyrazole Derivatives

In connection with the preceding researches on pilocarpine, some new substances, glyoxaline and pyrazole derivatives, were synthetically prepared, and their properties carefully determined. (*Journ. Chem. Soc.*, 1903, **83**, pp. 464-470.)

Composition and Character of Cerium Oxalate

The unsatisfactory pharmacopœial description and tests of cerium oxalate suggested an enquiry into the composition and character of this medicinal chemical. The methods for the separation of cerium from its associate elements were critically compared, and on the basis of these experiments a plan was devised for the quantitative determination of the amount of pure cerium oxalate in the commercial products. (*Journ. Soc. Chem. Ind.*, 1900, **19**, pp. 636-642.)

Researches on Morphine

In order to ascertain the relationship existing between the physiological action and the chemical constitution of morphine, a number of new derivatives of this alkaloid were prepared and physiologically tested, and some new products having a chemical structure analogous to that of morphine were also prepared by electro-synthesis. The latter compounds gave rise to considerations involving some interesting points in chemical dynamics. (*Journ. Chem. Soc.*, 1900, **77**, pp. 1024-1039; 1901, **79**, pp. 563-580; 1903, **83**, pp. 750-763.)

Composition of Berberine Phosphate

As considerable discrepancy had existed in chemical literature respecting the formula for berberine phosphate, in the course of some more extended work on berberine salts the true composition of the phosphate was determined. (*Year Book of Pharmacy*, 1900, pp. 507-513.)

Soluble Manganese Compounds

The desirability of rendering manganese available for medicinal use in a soluble and easily assimilable form, led to some experiments resulting in the production of a soluble manganese citrate and a compound of the latter with iron, as also a soluble iron and manganese phosphate. These were all obtained in the form of brilliant scales. (*Year Book of Pharmacy*, 1901, pp. 458-465.)

(I.) So-called Iodo-Tannin Compounds.
(II.) Some New Derivatives of Gallic Acid

For many years, preparations have been used medicinally which have been regarded as actual chemical compounds of iodine and tannin, and somewhat extended observations have been recorded, especially in pharmaceutical literature, which were supposed to confirm this view. This subject was

therefore fully investigated in these laboratories, and it was proved that the action of iodine upon tannic acid does not result in the formation of any compound of the latter containing this element. In the subsequent endeavour to prepare a definite compound of iodine and gallic acid, several new and interesting derivatives of the latter were obtained. (*Year Book of Pharmacy*, 1901, 466-476, and *Journ. Chem. Soc.*, 1902, **81**, pp. 43-48.)

Essential Oils of Asarum Canadense, Rue and Californian Laurel

Three essential oils have been examined with reference to the nature of their constituents, and the latter in some instances were made the subject of further and independent chemical study. They comprised (1) the oil of *Asarum canadense*; (2) an oil of rue, and (3) the oil of Californian laurel. The many interesting constituents of these natural products are shown in connection with specimens of the original oils from which they were isolated. (*Journ. Chem. Soc.*, 1902, **81**, pp. 59-73, 1585-1594.)

Benzoxy-Olefines

The investigation of the above-mentioned essential oil of rue led to a special study of the interaction of ketones and aldehydes with acid chlorides. This was shown to result in the formation of a class of substances known as benzoxy-olefines, and one of the particularly interesting products obtained was the benzoate of the enolic modification of camphor. (*Journ. Chem. Soc.*, 1903, **83**, pp. 145-154.)

Anthraquinone Derivatives

An exhaustive investigation into the nature of certain anthraquinone derivatives occurring in nature has been undertaken and is still being pursued. The results of an examination of commercial chrysarobin, for many years supposed to be chrysophanic acid, and of an enquiry pertaining to the constitution of chrysophanic acid and of emodin, have already been published. (*Journ. Chem Soc.*, 1902, **81**, pp. 1575-1585; 1903, **83**, pp. 1327-1334.)

Constituents of Chaulmugra Seeds

An investigation of the constituents of chaulmugra seeds has been undertaken, and, although still in progress, some exceedingly interesting results have already been obtained.

(I.) Salinigrin—A New Glucoside. (II.) Comparative Examination of Willow and Poplar Barks

As already indicated, considerable attention has been devoted to the investigation of crude drugs possessing either medicinal or technical value. For example, the examination of a specimen of commercial willow bark led to the discovery of a new glucoside, salinigrin. This was shown to be the glucoside of m-oxybenzaldehyde. (*Journ. Chem. Soc.*, 1900, **77**, pp. 707-712.) By the subsequent examination of a large number of different species of American and British willows it was ascertained that the particular species yielding salinigrin is *Salix discolor*, Muhl. At the same time, some very interesting variations were observed respecting the amount of salicin contained in these barks at different seasons of the year, and in trees of different sex. (*Year Book of Pharmacy*, 1902, pp. 483-490.)

Among other drugs of which a thorough examination has been made, the following may be mentioned :—

Robinia Pseud-Acacia, Linn.

Several years ago, one of the present investigators had isolated from the bark of this tree a very poisonous proteid, termed robin. The characters of this principle have now been somewhat further studied. (*Year Book of Pharmacy*, 1901, pp. 349-372.)

Derris Uliginosa, Benth.

The stem of this plant is used in the Far East as a fish poison. This property was found to reside in a resin, which, together with other constituents of the drug, was chemically examined. (*Proc. Amer. Pharm. Assoc.*, 1902, **50**, pp. 296-321.)

Kô-sam Seeds (Brucea Sumatrana, Roxb.)

This drug was obtained from the East Indies. It has recently been brought prominently to notice on account of its reputed value in the treatment of tropical dysentery. The seeds yield a large amount of a fatty oil, which was very completely examined. Two bitter principles were also isolated, and certain statements of previous investigators regarding the character of these were shown to be erroneous. (*Year Book of Pharmacy*, 1903, pp. 503-522.)

Cascara Sagrada

An exhaustive chemical examination has been made of

perfectly authentic barks, especially collected for the purpose. In the course of this investigation, particular attention has been paid to the numerous discrepancies of statement in the literature of the subject, with the endeavour to afford a correct presentation of the facts respecting the constituents of these valuable medicinal barks.

Pharmacognosy of Strophanthus, Robinia and Derris

In the department of pharmacognosy very careful studies have been made of the anatomical characters of strophanthus seeds, robinia bark, and derris, thus in several cases supplementing the previously mentioned chemical examination of the respective drugs. The descriptive details of this work are elucidated by a number of handsomely executed original drawings. (*Year Book of Pharmacy*, 1900, pp. 366-393; *Pharm. Journ.*, 1901, **66**, pp. 518-521; *Year Book of Pharmacy*, 1901, pp. 372-382: *Proc. Amer. Pharm. Assoc.*, 1902, **50**, pp. 321-331.)

Anatomy of the Salicaceæ

An exhaustive investigation of the comparative anatomy of the barks of the *Salicaceæ* is also in progress, and the first part of this work, treating of the poplars, has already been published. (*Year Book of Pharmacy*, 1903, pp.442-479.)

List of Specimens Exhibited

The Essential Oil of Asarum Canadense

Constituents of the Oil

Pinene	Bornyl Acetate
Linalool	Terpineol
Linalyl Acetate	Eugenol Methyl Ether
Geraniol	Blue Oil
Geranyl Acetate	Palmitic Acid
Borneol	

The Essential Oil of Algerian Rue

Constituents of the Oil

Methyl-n-heptylketone	Blue Oil
Methyl-n-nonylketone	Methyl Salicylate
Methyl-n-heptylcarbinol	Pinene
Methyl-n-heptylcarbinyl Acetate	Limonene
Methyl-n-nonylcarbinol	Cineol

THE ESSENTIAL OIL OF CALIFORNIAN LAUREL

Constituents of the Oil

Eugenol
Pinene
Cineol
Umbellulone
Eugenol Methyl Ether
Safrol

SUBSTANCES ISOLATED FROM CHAULMUGRA SEEDS

Chaulmugra Oil
Total Fatty Acid
Chaulmugric Acid
A hydrolytic Enzyme

DERIVATIVES OF CHAULMUGRIC ACID

Ammonium Chaulmugrate
Potassium Chaulmugrate
Magnesium Chaulmugrate
Zinc Chaulmugrate
Manganese Chaulmugrate
Chaulmugric Amide
Ethyl Chaulmugrate
Lithium Chaulmugrate
Calcium Chaulmugrate
Iron Chaulmugrate
Copper Chaulmugrate
Lead Chaulmugrate
Methyl Chaulmugrate
Dihydrochaulmugric Acid
Monobromodihydrochaulmugric Acid
Methyl Dihydrochaulmugrate

SALTS OF THE ALKALOIDS OF JABORANDI LEAVES

Pilocarpine Nitrate
Pilocarpine Hydrochloride
Pilocarpine Hydrobromide
iso Pilocarpine Nitrate
iso Pilocarpine Hydrobromide
Pilocarpidine Nitrate

SUBSTANCES RELATING TO THE CONSTITUTION OF PILOCARPINE

iso Pilocarpinolactone
Pilopic Acid
Pilopic Amide
Barium Pilocarpinate
Dibromo*iso*pilocarpine
Dibromopilocarpine
α-Ethyltricarballylic Acid, from Homopilopic Acid
Dibromo*iso*pilocarpinic Acid
α-Ethyltricarballylic Acid, synthetic
Barium Hydroxypilopate
Ethylic α-ethyl-β-cyanotricarballylate
1 : 3-Dimethylpyrazole
1 : 3-Dimethylpyrazole Methiodide
4 : 5-Dibromo—1 : 3-dimethylpyrazole
4 (or 5) Methylglyoxaline
Methylamylglyoxaline Platinichloride

1 : 4 (or 1 : 5)-Dimethylglyoxaline
1 : 4 (or 1 : 5)-Dimethylglyoxaline Picrate
1 : 2-Dimethylglyoxaline
1 : 2-Dimethylglyoxaline Platinichloride
Ethylic ethylcyanosuccinate

THE CONSTITUENTS OF COMMERCIAL CHRYSAROBIN AND SUBSTANCES RELATING TO THE CONSTITUTION OF CHRYSOPHANIC ACID AND OF EMODIN

Chrysarobin
Acetylmethyldichrysarobin
Methyldichrysarobin
Dichrysarobin
Triacetylchrysarobin
Chrysophanic Acid from Chrysarobin
Chrysarobin, commercial
3 : 5 Dioxydimethylanthraquinone
Emodin Monomethyl Ether
Diacetyldimethyldioxyanthraquinone
1 : 5 Dioxydimethylanthraquinone

MORPHOLONES, AND DERIVATIVES PRODUCED BY ELECTRO-SYNTHESIS

N-Methylphenmorpholine Hydrochloride
Ethenylorthoaminophenol
N-Acetylmethylorthoaminophenol
N-Methylorthoaminophenol Hydrochloride
α-Nitro-β-naphthoxyacetic Acid
β-Naphthomorpholone
N-Methyl-β-naphthomorpholone
Acetyl-N-methylethyl-α-amino-β-naphthol
N-Methylethyl-α-amino-β-naphthol sulphocamphylate

SUBSTANCES ISOLATED FROM KÔ-SAM SEEDS

Fatty Oil
Oleic Acid
Stearic Acid
Palmitic Acid
Hentriacontane
A crystalline Alcohol
Bitter Principle
A hydrolytic Enzyme

SUBSTANCES ISOLATED FROM CASCARA BARK

Emodin
Arachidic Acid
Rhamnol
Rhamnol Acetate
Syringic Acid
Linolic Acid
An Enzyme

New derivatives of Gallic Acid

Ethyltriacetylgallate
Ethyldinitrodiacetylgallate
Ethyldinitrotriacetylgallate
Ethyldinitrogallate
Sodium Ethyldinitrogallate
Ethylmonaminogallate Hydrochloride
Diazoethylgallate

Substances obtained in Researches on Morphine

Chloromorphide
Chloromorphide Hydrochloride
Chloromorphide Hydrobromide
Acetylchloromorphide
Bromomorphide
Bromomorphide Hydrochloride
Bromomorphide Hydrobromide
Isomorphine Hydrochloride
Isomorphine Hydrobromide
Deoxymorphine Hydrochloride
Bromocodeide
Isomorphine

Phenylic Salts of Dibasic Acids

Eugenyl Hydrogen Camphorate
Guaiacyl Hydrogen Camphorate
Guaiacyl Camphorate
Guaiacyl Zinc Camphorate
Naphthyl Hydrogen Camphorate
Phenyl Hydrogen Camphorate
Guaiacyl Hydrogen Succinate
Thymyl Hydrogen Camphorate
Thymyl Hydrogen Succinate
Thymyl Hydrogen Phthalate
Creosote Hydrogen Camphorate
Menthyl Hydrogen Camphorate
Santalyl Hydrogen Camphorate

Benzoxy-olefines

β-Benzoxyundecylene
β-Valeroxyundecylene
β-Benzoxynonylene
β-Benzoxy-γ-methylheptylene
β-Benzoxyhexylene
α-Benzoxy-α-phenylethylene
α-Benzoxyheptylene
Benzoxycamphene

Substances isolated from Derris

Derris Resin (soluble in chloroform)
Derris Resin (insoluble in chloroform)
Cholesterol
Arachidic Acid
Stearic Acid
Ceryl Alcohol

The active principle of Robinia Pseud-acacia

Robin

Substances illustrating the investigation of Cerium Oxalate

Cerium Oxalate
Cerium Oxide
Didymium Oxalate
Didymium Oxide
Lanthanum Oxalate
Lanthanum Oxide

Substances used in the investigation of the Hypophosphites

Calcium Hypophosphite
Potassium Hypophosphite
Sodium Hypophosphite

New preparations of Manganese and Iron

Manganese and Iron Citrate
Manganese and Iron Phosphate
Manganese Citrate, soluble
Ferric Hypophosphite, soluble

Salinigrin and its Hydrolytic products

Salinigrin
Glucose
Metahydroxybenzaldehyde

Berberine Phosphate

A Synthetic Ketone

Methyl-β-methylhexylketone

New Gold Salts of Hyoscine and Hyoscyamine

Hyoscine Hydrobromide Gold Chloride
Hyoscyamine Hydrobromide Gold Chloride

London, *May, 1904*